

UN PORTABLE TANK TABLE FOR LIQUEFIED COMPRESSED GASES—Continued

| UN No.     | Non-refrigerated liquefied compressed gases | Minimum design pressure (bar) small; bare; sunshield; insulated | Openings below liquid level | Pressure relief requirements (See § 178.276(e)) | Maximum filling density (kg/l) |
|------------|---|---|-----------------------------|---|--------------------------------|
| 3338 ..... | Refrigerant gas R 407A .....                | 28.3<br>25.3<br>22.5<br>31.3<br>28.1<br>25.1                    | Allowed                     | Normal  | 0.95                           |
| 3339 ..... | Refrigerant gas R 407B .....                | 22.4<br>33.0<br>29.6<br>26.5<br>23.6                            | Allowed                     | Normal  | 0.95                           |
| 3340 ..... | Refrigerant gas R 407C .....                | 29.9<br>26.8<br>23.9<br>21.3                                    | Allowed                     | Normal  | 0.95                           |

[69 FR 76174, Dec. 20, 2004, as amended at 70 FR 34399, June 14, 2005]

**§ 173.314 Compressed gases in tank cars and multi-unit tank cars.**

(a) *Definitions.* For definitions of compressed gases, see § 173.115.

(b) *General requirements.* (1) Tank car tanks containing compressed gases must not be shipped unless they were loaded by or with the consent of the owner thereof.

(2) Tank car tanks must not contain gases capable of combining chemically and must not be loaded with any gas which combines chemically with the gas previously loaded therein, until all residue has been removed and interior of tank thoroughly cleaned.

(3) For tanks of the DOT-106A and 110A class, the tanks must be placed in position and attached to car structure by the shipper.

(4) Wherever the word “approved” is used in this part of the regulations, it means approval by the Association of

American Railroads Committee on Tank Cars as prescribed in § 179.3 of this subchapter.

(5) Each tank car used for the transportation of anhydrous ammonia or any material that meets the criteria of Division 2.1 or 2.3 must have gaskets for manway cover plates and for mounting of fittings designed (for temperature, application, media, pressure, and size) to create a positive seal so that, under conditions normally incident to transportation, there will not be an identifiable release of the material to the environment. The use of sealants to install gaskets is prohibited.

(c) *Authorized gases, filling limits for tank cars.* A compressed gas in a tank car or a multi-unit tank car must be offered for transportation in accordance with § 173.31 and this section. The named gases must be loaded and offered for transportation in accordance with the following table:

| Proper shipping name   | Outage and filling limits (see note 1) | Authorized tank car class     |
|--|--|-------------------------------|
| Ammonia, anhydrous, or ammonia solutions > 50 percent ammonia.         | Notes 2, 10 .....                      | 105, 112, 114, 120.           |
| Ammonia solutions with > 35 percent, but ≤ 50 percent ammonia by mass. | Note 3 .....                           | 106.                          |
| Argon, compressed .....  | Note 3 .....                           | 105, 109, 112, 114, 120.      |
| Boron trichloride .....  | Note 4 .....                           | 107.                          |
| Carbon dioxide, refrigerated liquid .....                              | Note 3 .....                           | 105, 106.                     |
| Chlorine .....   | Note 5 .....                           | 105.                          |
| Chlorine trifluoride .....   | Note 6 .....                           | 105.                          |
| Chlorine pentafluoride .....   | 125 .....                              | 106.                          |
| Dimethyl ether .....   | Note 3 .....                           | 106, 110.                     |
|  | Note 3 .....                           | 106, 110.                     |
|  | Note 3 .....                           | 105, 106, 110, 112, 114, 120. |

| Proper shipping name   | Outage and filling limits (see note 1) | Authorized tank car class          |
|--|--|------------------------------------|
| Dimethylamine, anhydrous .....   | Note 3 .....                           | 105, 106, 112.                     |
| Dinitrogen tetroxide, inhibited .....                                    | Note 3 .....                           | 105, 106, 110.                     |
| Division 2.1 materials not specifically identified in this table .....   | Notes 9, 10 .....                      | 105, 106, 110, 112, 114, 120.      |
| Division 2.2 materials not specifically identified in this table .....   | Note 3 .....                           | 105, 106, 109, 110, 112, 114, 120. |
| Division 2.3 Zone A materials not specifically identified in this table. | None .....                             | See § 173.245.                     |
| Division 2.3 Zone B materials not specifically identified in this table. | Note 3 .....                           | 105, 106, 110, 112, 114, 120.      |
| Division 2.3 Zone C materials not specifically identified in this table. | Note 3 .....                           | 105, 106, 110, 112, 114, 120.      |
| Division 2.3 Zone D materials not specifically identified in this table. | Note 3 .....                           | 105, 106, 109, 110, 112, 114, 120. |
| Ethylamine .....   | Note 3 .....                           | 105, 106, 110, 112, 114, 120.      |
| Helium, compressed .....   | Note 4 .....                           | 107.                               |
| Hydrogen .....   | Note 4 .....                           | 107.                               |
| Hydrogen chloride, refrigerated liquid .....                             | Note 7 .....                           | 105.                               |
| Hydrogen sulphide, liquified .....                                       | 68 .....                               | 106.                               |
| Methyl bromide .....   | Note 3 .....                           | 105, 106.                          |
| Methyl chloride .....  | Note 3 .....                           | 105, 106, 112.                     |
| Methyl mercaptan .....   | Note 3 .....                           | 105, 106.                          |
| Methylamine, anhydrous .....   | Note 3 .....                           | 105, 106, 112.                     |
| Nitrogen, compressed .....   | Note 4 .....                           | 107.                               |
| Nitrosyl chloride .....  | 124 .....                              | 105.                               |
|  | 110 .....                              | 106.                               |
| Nitrous oxide, refrigerated liquid .....                                 | Note 5 .....                           | 105.                               |
| Oxygen, compressed .....   | Note 4 .....                           | 107.                               |
| Phosgene .....   | Note 3 .....                           | 106.                               |
| Sulfur dioxide, liquified .....  | 125 .....                              | 105, 106, 110.                     |
| Sulfuryl fluoride .....  | 120 .....                              | 105.                               |
| Vinyl fluoride, stabilized .....   | Note 8 .....                           | 105.                               |

NOTES: 1. The percent filling density for liquefied gases is hereby defined as the percent ratio of the mass of gas in the tank to the mass of water that the tank will hold. For determining the water capacity of the tank in kilograms, the mass of 1 L of water at 15.5 °C in air is 1 kg. (the mass of one gallon of water at 60 °F in air is 8.32828 pounds).

2. The liquefied gas must be loaded so that the outage is at least two percent of the total capacity of the tank at the reference temperature of 46 °C (115 °F) for a noninsulated tank; 43 °C (110 °F) for a tank having a thermal protection system incorporating a metal jacket that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 10.22 kilojoules per hour per square meter per degree Celsius (0.5 Btu per hour per square foot per degree F) temperature differential; and 41 °C (105 °F) for an insulated tank having an insulation system incorporating a metal jacket that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 1.5333 kilojoules per hour per square meter per degree Celsius (0.075 Btu per hour per square foot per degree F) temperature differential.

3. The requirements of § 173.24b(a) apply.

4. The gas pressure at 54.44 °C (130 °F.) in any non-insulated tank car may not exceed 7/10 of the marked test pressure, except that a tank may be charged with helium to a pressure 10 percent in excess of the marked maximum gas pressure at 54.44 °C (130 °F.) of each tank.

5. The liquid portion of the gas at -17.77 °C (0 °F.) must not completely fill the tank.

6. The maximum permitted filling density is 125 percent. The quantity of chlorine loaded into a single unit-tank car may not be loaded in excess of the normal lading weights nor in excess of 81.65 Mg (90 tons).

7. 89 percent maximum to 80.1 percent minimum at a test pressure of 6.2 Bar (90 psig).

8. 59.6 percent maximum to 53.6 percent minimum at a test pressure of 7.2 Bar (105 psig).

9. For a liquefied petroleum gas, the liquefied gas must be loaded so that the outage is at least one percent of the total capacity of the tank at the reference temperature of 46 °C (115 °F) for a noninsulated tank; 43 °C (110 °F) for a tank having a thermal protection system incorporating a metal jacket that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 10.22 kilojoules per hour per square meter per degree Celsius (0.5 Btu per hour per square foot per degree F) temperature differential; and 41 °C (105 °F) for an insulated tank having an insulation system incorporating a metal jacket that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 1.5333 kilojoules per hour per square meter per degree Celsius (0.075 Btu per hour per square foot per degree F) temperature differential.

10. For liquefied petroleum gas and anhydrous ammonia, during the months of November through March (winter), the following reference temperatures may be used: 38 °C (100 °F) for a noninsulated tank; 32 °C (90 °F) for a tank having a thermal protection system incorporating a metal jacket that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 10.22 kilojoules per hour per square meter per degree Celsius (0.5 Btu per hour per square foot per degree F) temperature differential; and 29 °C (85 °F) for an insulated tank having an insulation system incorporating a metal jacket and insulation that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 1.5333 kilojoules per hour per square meter per degree Celsius (0.075 Btu per hour per square foot per degree F) temperature differential. The winter reference temperatures may only be used for a tank car shipped directly to a consumer for unloading and not stored in transit. The owner of the tank must inform each customer that the tank car was filled based on winter reference temperatures. The tank must be unloaded as soon as possible after March in order to retain the specified outage and to prevent a release of hazardous material which might occur due to the tank car becoming liquid full at higher temperatures.

(d) [Reserved]

(e) *Verification of content.* The amount of liquefied gas loaded into each tank may be determined either by measurement or calculation of the weight. If by measurement, the weight must be

checked after disconnecting the loading line by the use of proper scales. If by calculation, the weight of liquefied petroleum gas, methylacetylene propadiene, stabilized, dimethylamine, methylamine anhydrous, or

trimethylamine may be calculated using the outage tables supplied by the tank car owners and the specific gravities as determined at the plant, and this computation must be checked by determination of specific gravity of product after loading. Carriers may verify calculated weights by use of proper scales. The use of a fixed tube gauge device is authorized for determining the weight of methyl mercaptan in Specification 105A300W tanks instead of weighing.

(f) [Reserved]

(g) Special requirements for hydrogen chloride, refrigerated liquid, and vinyl fluoride, stabilized.

(1) The shipper shall notify the Federal Railroad Administration whenever a tank car is not received by the consignee within 20 days from the date of shipment. Notification to the Federal Railroad Administration may be made by e-mail to [Hmassist@fra.dot.gov](mailto:Hmassist@fra.dot.gov) or telephone call to (202) 493-6229.

(2) A tank car containing hydrogen chloride, refrigerated liquid must have the auxiliary valve on the pressure relief device closed during transportation.

(3) See § 179.102-17 of this subchapter for additional requirements.

(4) Tank cars containing hydrogen chloride, refrigerated liquid, must be unloaded to such an extent that any residue remaining in the tank at a reference temperature of 32 °C (90 °F) will not actuate the reclosing pressure relief device.

(h)-(i) [Reserved]

(j) *Special requirements for materials having a primary or secondary Division 2.1 (flammable gas) hazard.* For single unit tank cars, interior pipes of loading and unloading valves, sampling devices, and gauging devices with an opening for the passage of the lading exceeding 1.52 mm (0.060 inch) diameter must be equipped with excess flow valves. For single unit tank cars constructed before January 1, 1972, gauging devices must conform to this paragraph by no later than July 1, 2006. The protective housing cover must be provided with an opening, with a weather-proof cover, above each pressure relief valve that is concentric with the discharge of the pressure relief valve and that has an area at least equal to the

valve outlet area. Class DOT 109 tank cars and tank cars manufactured from aluminum or nickel plate are not authorized.

(k) *Special requirements for chlorine.* Tank cars built after September 30, 1991, must have an insulation system consisting of 5.08 cm (2 inches) glass fiber placed over 5.08 cm (2 inches) of ceramic fiber. Tank cars must have excess flow valves on the interior pipes of liquid discharge valves. Tank cars constructed to a DOT 105A500W specification may be marked as a DOT 105A300W specification with the size and type of reclosing pressure relief valves required by the marked specification.

(l) *Special requirements for hydrogen sulphide.* Each multi-unit tank car must be equipped with adequate pressure relief devices of the fusible plug type having a yield temperature not over 76.66 °C (170 °F.), and not less than 69.44 °C (157 °F.). Each device must be resistant to extrusion of the fusible alloy and leak tight at 55 °C (130 °F.). A threaded solid plug must seal each valve outlet. In addition, a metal cover must protect all valves.

(m) *Special requirements for nitrosyl chloride.* Single unit tank cars and their associated service equipment, such as venting, loading and unloading valves, and reclosing pressure relief valves, must be made of metal or clad with a material that is not subject to rapid deterioration by the lading. Multi-unit tank car tanks must be nickel-clad and have reclosing pressure relief devices incorporating a fusible plug having a yield temperature of 79.44 °C (175 °F.). Reclosing pressure relief devices must be vapor tight at 54.44 °C (130 °F.).

(n) *Special requirements for hydrogen.* Each tank car must be equipped with one or more pressure relief devices. The discharge outlet for each pressure relief device must be connected to a manifold having a non-obstructed discharge area of at least 1.5 times the total discharge area of the pressure relief devices connected to the manifold. All manifolds must be connected to a single common header having a non-obstructed discharge pointing upward and extending above the top of the car. The header and the header outlet must each have a non-obstructed discharge area

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at least equal to the total discharge area of the manifolds connected to the header. The header outlet must be equipped with an ignition device that will instantly ignite any hydrogen discharged through the pressure relief device.

(o) *Special requirements for carbon dioxide, refrigerated liquid and nitrous oxide, refrigerated liquid.* Each tank car must have an insulation system so that the thermal conductance is not more than 0.613 kilojoules per hour, per square meter, per degree Celsius (0.03 B.t.u. per square foot per hour, per degree Fahrenheit) temperature differential. Each tank car must be equipped with one reclosing pressure relief valve having a start-to-discharge pressure not to exceed 75 percent of the tank test pressure and one non-reclosing pressure relief valve having a rupture disc design to burst at a pressure less than the tank test pressure. The discharge capacity of each pressure relief device must be sufficient to prevent building up of pressure in the tank in excess of 82.5 percent of the test pressure of the tank. Tanks must be equipped with two regulating valves set to open at a pressure not to exceed 24.1 Bar (350 psi) on DOT 105A500W tanks and at a pressure not to exceed 27.6 Bar (400 psi) on DOT 105A600W tanks. Each regulating valve and pres-

sure relief device must have its final discharge piped to the outside of the protective housing.

[Amdt. 173–224, 55 FR 52665, Dec. 21, 1990]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting § 173.314, see the List of CFR Sections Affected which appears in the Finding Aids section of the printed volume and on GPO Access.

### § 173.315 Compressed gases in cargo tanks and portable tanks.

(a) Liquefied compressed gases that are transported in UN portable tanks, DOT specification portable tanks, or cargo tanks must be prepared in accordance with this section, § 173.32, § 173.33 and subpart E or subpart G of part 180 of this subchapter, as applicable. For cryogenic liquid in cargo tanks, see § 173.318. For marking requirements for portable tanks and cargo tanks, see § 172.326 and § 172.328 of this subchapter, as applicable.

(1) *UN portable tanks:* UN portable tanks must be loaded and offered for transportation in accordance with portable tank provision T50 in § 172.102 of this subchapter.

(2) *Cargo tanks and DOT specification portable tanks:* Cargo tanks and DOT specification portable tanks must be loaded and offered for transportation in accordance with the following table:

| Kind of gas   | Maximum permitted filling density |   | Specification container required                 |                                    |
|---|-----------------------------------|---|--|------------------------------------|
|   | Percent by weight<br>(see Note 1) | Percent by volume<br>(see par. (f) of this section) | Type (see Note 2)                                | Minimum design pressure (psig)     |
| Ammonia, anhydrous or Ammonia solutions with greater than 50 percent ammonia (see Notes 14 and 17). | 56 .....                          | 82, See Note 5 .....                                | DOT-51, MC-330, MC-331; See Notes 12, 17 and 27. | 265; See Note 17.                  |
| Ammonia solutions with more than 35 percent but not more than 50 percent ammonia.                   | See par. (c) of this section.     | See Note 7 .....                                    | DOT-51, MC-330, MC-331; see Note 12.             | 100; See par. (c) of this section. |
| Bromotrifluoromethane (R-13B1 or H-1301); (See Note 9).   | 133 .....                         | See Note 7 .....                                    | DOT-51, MC-330, MC-331.                          | 365.                               |
| Butadiene, stabilized .....   | See par. (b) of this section.     | See par. (b) of this section.                       | DOT-51, MC-330, MC-331.                          | 100.                               |
| Carbon dioxide, refrigerated liquid .....   | See par. (c)(1) of this section.  | 95 .....  | .....do .....                                    | 200; see Note 3.                   |
| Chlorine .....  | 125 .....                         | See Note 7 .....                                    | DOT-51, MC-330, MC-331.                          | 225; See Notes 4 and 8.            |
| Chlorodifluoroethane (R-142b) (1-Chloro 1,1-difluoroethane); (See Note 9).                          | 100 .....                         | See Note 7 .....                                    | DOT-51, MC-330, MC-331.                          | 100.                               |
| Chlorodifluoromethane (R-22); (See Note 9).   | 105 .....                         | See Note 7 .....                                    | DOT-51, MC-330, MC-331.                          | 250.                               |
| Chloropentafluoroethane (R-115); (See Note 9).  | See par. (c) of this section.     | See Note 7 .....                                    | DOT-51, MC-330, MC-331.                          | See par. (c) of this section.      |
| Chlorotrifluoromethane (R-13); (See Note 9).  | See par. (c) of this section.     | See Note 7 .....                                    | DOT-51, MC-330, MC-331.                          | See par. (c) of this section.      |